

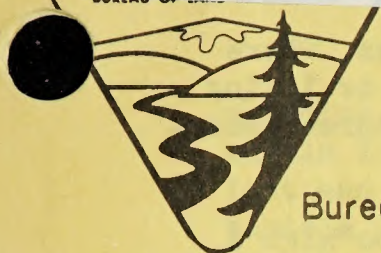


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TECHNICAL NOTE

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Bureau of Land Management U.S. DEPARTMENT OF THE INTERIOR

DRIVER ERROR

A skillful and competent driver of a vehicle equipped with air brakes must know something about the actuating system. He must compensate for error build-up-time which is not a factor in a hydraulic system. He must realize that if it takes one-half second for air to get from the reservoirs to the brake chambers forcing the shoes against the drum, this will represent an increased stopping distance of 44 feet from a speed of 60 miles per hour. Fortunately, the drivers of most air braked vehicles are seated high enough to see the traffic pattern ahead and have a definite advantage over the drivers of smaller vehicles. Nevertheless, he gets involved in accidents, usually for one of the following reasons:

1. Starting vehicle in motion before air pressure has built up.

This occurs only after air pressure has bled down. If the driver watches his gauge and his warning devices, he will never be guilty of this carelessness. Sometimes in the garage or storage yard a driver or mechanic must move a vehicle a short distance. Without waiting for air pressure build up he starts it in motion, can't stop, and runs into another vehicle, a wall or a door. This situation is eliminated when brakes are equipped with spring loaded or actuated emergency devices that preclude moving a vehicle until air build up has released the brakes.

2. Insufficient distance to vehicle ahead.

Tailgating is one of the most common faults of professional drivers. At speeds of 50 to 60 miles per hour they are often seen traveling 20 to 30 feet behind a vehicle, especially if it is an automobile operating below the speed limit. Often the car is operated by an inexperienced driver who may panic and hit the brake unexpectedly. The driver of the commercial vehicle then has three choices. (a) switch lanes and possibly become involved in an accident, (b) take to the shoulder, (c) hit the car ahead.

As mentioned previously, the air braked vehicle, because of the build up time involved, will require an additional 30 to 70 feet to stop from 60 miles per hour over that required by the passenger car.

3. Brake fade - heat or water.

It may appear that when a driver encounters brake fade, it can be blamed

on the maintenance department. This may be true in some cases, where the driver abuses his brakes to the point where drums expand or lining loses its coefficient of friction because of extreme temperatures generated into the brake assembly; it is a fault of the driver.

He may encounter this situation descending a long grade at too high a speed and over working his brakes in order to maintain vehicle control. It may develop after successive severe application in heavy, high speed traffic. If brakes are not power actuated, the driver is warned of this dangerous development because pedal effort progressively increases. With the comparatively small additional pedal effort required of power brakes, the situation develops with little or no warning.

Water fade is brought about by water splashing into the brake drum and forming a film between drum and lining. This film acts as a lubricant the same as an oil film in a bearing. When brakes are applied under this condition, braking effort is greatly reduced until the brake lining can wipe the water off the surface of the drum. It often takes several applications before full braking is restored.

To avoid water fade, the driver should keep his brakes lightly applied when going through deep puddles. On the highways where brakes are used infrequently and the highway is wet, brakes should be lightly applied at intervals to keep them dried out and available if the necessity arises.

4. Jack knife.

Jack knifing is one of the most frequent and costly accidents in which tractor-trailer rigs are involved usually, a jack knife is caused by a combination of driver error and an unbalanced or inefficient brake system. In some cases, the jack knife is apparently the fault of the driver, but he may have been forced into it attempting to avoid an accident with another vehicle.

An experienced and careful driver will check his brakes every time he starts a trip. If his brakes are below standard, he will drive accordingly and will avoid situations that may lead to an accident or a jack knife. When roads are slippery he will use brakes sparingly and be careful not to lock wheels. Once wheels are locked, a jack knife is eminent.

When descending a slippery hill, the driver should gear down, using available engine compression for braking and using the trailer control valve to control the train and keep the trailer in line with the tractor. If the driver does everything just as he should but the brakes on the unit are not balanced, he may still get into trouble. If one brake exerts more braking force than another, it may lock and cause the trailer to slide sideways. It is the responsibility of the maintenance department to keep brakes in such a condition as to reduce or eliminate this tendency. It is the responsibility of the driver to use brakes sensibly and correctly.

skidding. Care must be exercised to prevent locking of wheels since when wheels lock, control is lost. If front wheels lock, steering control is lost and the vehicle will continue forward. If rear wheels lock, the vehicle tends to skid sideways. Either condition usually is more dangerous than releasing the brakes and regaining steering control.

4. Wet weather.

In addition to the hazard of slippery roads, wet weather can be treacherous in that water finds its way into the brake assembly. This may result in "water fade" previously described.

5. Trailer Brakes.

Many tractor-trailer rigs are equipped with trailer brake valves which gives the driver independent control of trailer brakes. Use of trailer brakes alone may be desirable under certain conditions, such as avoiding a tendency to "jack knife." On the other hand, over braking the trailer on slippery roads may lock the wheels and increase the danger of jack-knifing. Excessive use of trailer brakes when descending grades will overwork them and cause premature wear of brake parts. In addition, excessive temperatures may develop in the brakes, causing heat fade and loss of brakes should an emergency arise. Tractor and trailer personnel and drivers normally should apply tractor and trailer brakes simultaneously by means of the brake pedal or treadle valve.

6. Parking Brake.

The parking brake should receive periodic attention from the maintenance department and should be kept in adjustment. Some drivers have habitually put a vehicle in gear when parking, but the parking brake should be engaged also.

In the event of failure of service brakes, the parking brake can be used to stop the vehicle. However, it should be applied carefully and gradually since a sudden application on a propeller shaft brake may snap the drive shaft or axle shaft, leaving the driver with no braking control whatsoever.

7. When not to use brakes.

Brakes should be used cautiously, or not at all, when crossing railroad tracks, chuck holes or extremely rough roads. When a wheel, with brakes applied, hits an obstacle, causing a wheel to bounce up off the ground it locks up immediately. When it hits the road again in locked position, the tires slide, causing flat spots, and a terrific strain is put upon springs, shackles, axle shafts, and power train. If a brake application is necessary, release brakes just before reaching the obstacle and reapply them after passing.

DRIVING RULES -- DO'S

1. Be courteous
2. Always check brakes before taking vehicle out.
3. In wet weather or after going through puddles, always dry out brakes by several prolonged applications.
4. Anticipate stops - brake accordingly.
5. Fan brakes to stop on icy or slippery pavement.
6. Down shift on steep grades.
7. Know the limitations of your brakes.
8. Report poor brakes.

DON'TS

1. Don't tailgate - keep safe distance.
2. Don't use trailer brakes for parking.
3. Don't use trailer brakes alone when descending grades, except in case of emergency.
4. Don't "fan" brakes on grades.
5. Don't "drag" brakes on down grades.
6. Don't keep brakes applied when wheels are about to hit railroad tracks or chuck holes. Release brakes when approaching, reapply after passing.
7. Don't lock wheels during braking.
8. Don't blame poor brakes for an accident. If brakes are bad drive accordingly.

REMEMBER

1. Drive intelligently, carefully and courteously.
2. Be sure brakes are in good operating condition.
3. Use, but don't abuse, the brakes and brake system.
4. You can't stop on a dime.

DRIVE AS THOUGH YOUR LIFE DEPENDS ON IT (IT DOES)

CORRECT USE OF BRAKES

Brakes should be applied and used in the same manner regardless of whether the actuating system is hydraulic, air or vacuum. The following suggestions are made to get safest operation, maximum performance and minimum wear.

1. Normal stops in traffic.

Apply brakes sufficiently far in advance of stopping point to slow vehicle smoothly and gradually. The careful, alert driver rarely finds it necessary to make sudden, hard brake applications.

2. Descending long grades.

The use of rapid, success brake applications, (fanning) is inadvisable and dangerous with air brake systems. Air may be used more rapidly than the compressor can recharge the system so that in the event of an emergency there will not be sufficient air pressure available to afford a safe stop.

Dragging brakes to maintain a constant speed heats lining and drums without giving them an opportunity to cool. Dangerous heat fade and drum expansion may develop.

A safe speed of descent should be decided upon by the driver. Assume that it is between 25 and 30 miles per hour. The vehicle should be permitted to accelerate 30 miles per hour and then brakes should be applied to smoothly slow the vehicle to 25 miles per hour. Brakes should then be released and the cycle repeated.

Heavily loaded vehicles should take advantage of engine compression and "downshift" before entering a grade.

3. Icy and slippery roads.

Whether either ice or packed snow is encountered, brakes must be used with extreme caution. Here the braking ability of a vehicle depends entirely upon the road condition and only a small portion of available brake capacity can be used. Normal friction between tire and road is about .6 on dry concrete. Under wet or icy conditions this may drop to .10 or less. "Fanning" or "pumping" of brakes is desirable in these circumstances and is the most effective method of reducing speed without minimum danger of

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